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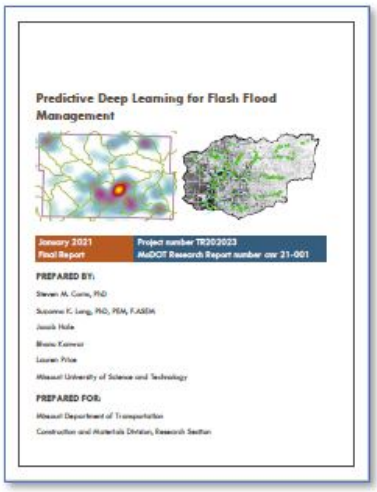
Research Summary

Predictive Deep Learning for Flash Flood Management



This research uses publicly available geospatial data to create a historic flash flood database that is then used as an input for a deep learning model capable of classifying flash flood risk for discrete locations within an area of interest (AOI).

The project scope includes analysis of publicly available flash flood data for a subwatershed in Greene County, Missouri that frequently experiences flash floods. This data was procured from USGS, NOAA, and NWS. A framework is presented that extends the utility of standard flash flood susceptibility maps by adding a dynamic predictive component based on potential rainfall events.

Flash flood susceptibility maps are not created with transportation-specific use cases involved. Consequently, there is no methodology available that provides both risk quantification and optimal rerouting guidance. The algorithms used in this research capture the complex relationship between geospatial characteristics and rainfall data to classify locations on the basis of their flash flood risk. Elevation, slope, aspect, and curvature constitute the geospatial data whereas day-of and prior rainfall observations represent the latter.

"A framework is presented that extends the utility of standard flash flood susceptibility maps by adding a dynamic predictive component based on potential rainfall events."

Three machine learning models were used: artificial neural network, logistic regression, and support vector machine. The artificial neural network exhibited superior performance with a prediction accuracy of 85.23%. At present, there are no flash flood prediction models being used by practitioners or local decision makers.

An additional component of the framework is the determination of optimal rerouting protocols that takes into account in-route traffic and road segments at high risk for flash flood events. This feature provides transportation officials with critical information that can guide the deployment of resources in a timely manner to minimize risk exposure to motorists.

Collectively, the framework presented here provides a suite of tools that are not currently in use at any level throughout the state.

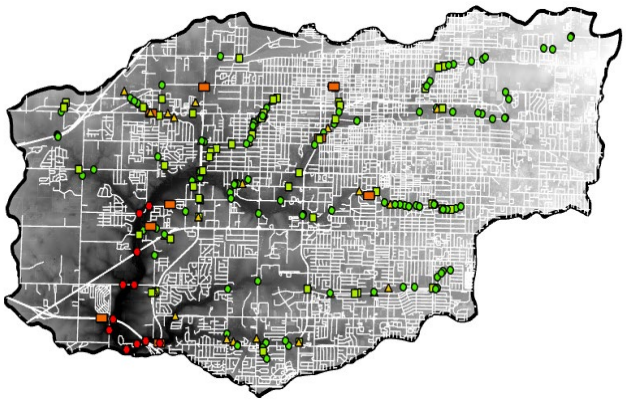


Figure 1: Flash Flood Risk for AOI in Greene County, MO

Project Information

PROJECT NAME: TR202023—Predictive Deep Learning for Flash Flood Management

PROJECT START/END DATE: March 10, 2020-December 31, 2020

PROJECT COST: $72,680

LEAD CONTRACTOR: Missouri University of Science and Technology

PRINCIPAL INVESTIGATOR: Steven Corns and Suzanna Long

REPORT NAME: Predictive Deep Learning for Flash Flood Management

REPORT NUMBER: cmr 21-001

REPORT DATE: January 2021

Project Manager

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